

CLAIMS

1. A light transmitting filter comprising:
 - (a) a layer of light absorbing material, the layer having a front surface and a back surface, and
 - 5 (b) a transparent layer having a microstructured first surface and a microstructured second surface, wherein the microstructures of the first surface are embedded in the light absorbing layer and have an exposed surface providing paths for transmitting light through the light absorbing layer and forming interstitial regions between the microstructures substantially filled with the light
 - 10 absorbing material, and wherein the microstructures of the second surface are optically aligned with the microstructures of the first surface to control light transmitted through the path.
2. The filter of claim 1 wherein the light absorbing layer comprises a polymeric material and at least one pigment or colorant.
- 15 3. The filter of claim 1 wherein the light absorbing layer comprises a polyacrylate, a polyurethane, or a polyvinyl acetal, and at least one pigment or colorant.
4. The filter of claim 1 wherein the transparent layer comprises a polyacrylate, a polycarbonate, a polyurethane or mixtures of two of more thereof.
- 20 5. The filter of claim 1 wherein the transparent layer comprises a polyacrylate.
6. The filter of claim 1 wherein the microstructures of the first surface have a height of up to about 250 microns.
7. The filter of claim 1 wherein the microstructures of the first surface
- 25 have a height of about 25 to about 125 microns.
8. The filter of claim 1 wherein the first surface of the transparent layer is covered with lenticular lenses, barrel lenses, or combinations thereof.
9. The filter of claim 1 wherein the microstructures of the first surface
- 30 comprise cylinders, truncated cones, pyramids, rectangles, hemispheres, squares, hexagon, ridges, and or combinations of two or more thereof.

10. The filter of claim 1 wherein the second surface of the transparent layer is covered with a Fresnel lens.

11. The filter of claim 1 wherein the transparent layer comprises a multilayered film.

5 12. The filter of claim 1 wherein the microstructures of the second surface have a height up to about 300 microns.

13. The filter of claim 1 wherein the microstructures of the second surface have the same dimensions as the microstructures of the first surface.

10 14. The filter of claim 1 wherein the microstructures of the second surface comprise hemispheres.

15. The filter of claim 1 further comprising an optically clear support layer having a front and back surface wherein the back surface is adhered to the front surface of the light absorbing layer.

15 16. The filter of claim 15 wherein the clear support layer comprises glass, or an optically clear polymeric film.

17. The filter of claim 15 wherein the clear support layer comprises a polyester, polyurethane or a polyacrylate.

18. The filter of claim 15 wherein the front surface of the clear support layer is covered with lenticular lenses, barrel lenses, or combinations thereof.

20 19. The filter of claim 1 wherein the microstructured second surface has a textured finish.

25 20. The filter of claim 1 further comprising an optically clear, substantially uniform, conformable layer having a front surface and a back surface, wherein the front surface covers the microstructured second surface of the transparent layer.

21. The filter of claim 20 wherein the conformable layer has an average thickness from about 2.5 microns to about 270 microns.

22. The filter of claim 20 wherein the conformable layer comprises a polyvinylbutyral, a polyurethane or a polyester.

23. The filter of claim 20 wherein the back surface of the conformable layer has a textured finish.

24. A method of making a light transmitting filter comprising the steps of:

5 (1) providing a transparent film having a first microstructured surface and second microstructured surface wherein the microstructures of the first surface form interstitial regions between the microstructures and wherein the microstructures of the first surface are optically aligned with the microstructures of the second surface;

10 (2) providing a layer of light absorbing material having a first and a second surface; and

(3) embedding the microstructures of the first surface of the transparent film into the light absorbing material to a depth sufficient to form light passages through the light absorbing layer, wherein the interstitial regions
15 between the microstructures are substantially filled with light absorbing material.

25. The method of claim 24 wherein the microstructures of the first surface have a height of up to about 250 microns.

26. The method of claim 24 wherein the microstructures of the first surface comprise cylinders, truncated cones or pyramids, rectangles,
20 hemispheres, squares, hexagon, ridges, and or combinations of two or more thereof.

27. The method of claim 24 wherein the second surface of the transparent layer is covered with a Fresnel lens.

28. The method of claim 24 wherein the microstructures of the second
25 surface have a height up to about 300 microns.

29. The method of claim 24 wherein the microstructures on the second surface have the same dimensions as the microstructures of the first surface.

30. The method of claim 24 wherein the microstructures of the second surface comprise hemispheres.

31. The method of claim 24 further comprising adhering an optically clear support layer to the first surface of the light absorbing layer.

32. The method of claim 31 wherein the clear support layer comprises glass, or an optically clear polymeric film.

5 33. The method of claim 24 further comprising the step of applying a conformable coating to the microstructures of the second surface of the transparent layer.

34. A method of making a light transmitting filter comprising the steps of:

10 (1) providing a first transparent film having a first and second surface and microstructures on its first surface;

(2) providing a second transparent film having a microstructured first surface and a second surface;

15 (3) providing a layer of light absorbing material having a first and second surface;

(4) embedding the microstructures of the first surface of the first transparent film into the light absorbing layer to a depth sufficient to form light passages through the light absorbing layer; and

20 (5) laminating the second surface of the first transparent film to the second surface of the second transparent film so that the microstructures of the first transparent film are optically aligned with the microstructures of the second transparent film.

35. The method of claim 34 wherein the laminating step occurs prior to the step of embedding the microstructures.

25 36. The method of claim 34 wherein the laminating step occurs subsequent to the step of embedding the microstructures.

37. The method of claim 34 wherein the microstructures of the first transparent film have a height of up to about 250 microns.

30 38. The method of claim 35 wherein the microstructures of the first transparent film comprise cylinders, truncated cones or pyramids, rectangles,

AVERP2861USA

hemispheres, squares, hexagon, ridges, and or combinations of two or more thereof.

39. The method of claim 34 wherein the microstructures of the second transparent film have a height up to about 300 microns.

5 40. The method of claim 34 wherein the microstructures of both films are the substantially the same dimensions.

41. The method of claim 34 wherein the microstructures of the second transparent film comprise hemispheres.

10 42. The method of claim 34 further comprising adhering an optically clear support layer to the first surface of the light absorbing layer.

43. The method of claim 42 wherein the clear support layer comprises glass, or an optically clear polymeric film.

44. The method of claim 34 further comprising the step of applying a conformable coating to the microstructures of the second transparent layer.

15